

INNOLUX DISPLAY CORPORATION

MT220WW01 V.B LCD MODULE SPECIFICATION

() Preliminary Specificati	or	1
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(
) Final Specification

Customer	Checked & Approved by

Approved by		Checked by		Prepared by
MKT	QRA	TD	PD	MKT
	W			

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Version	Revise Date	Page	Content								
1.0	2007/6/04	All	Initial Release								

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Global LCD Panel Exchange Center

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A. General Specification

NO.	Item	Specification	Remark
1	Display resolution (pixel)	1680(H) X 1050(V), WSXGA+ resolution	
2	Active area (mm)	473.76(H) X 296.1(V)	
3	Screen size (inch)	22 inches diagonal	
4	Pixel pitch (mm)	0.282(H) X 0.282(V)	
5	Color configuration	R, G, B vertical stripe	
6	Overall dimension (mm)	493.7 (W) X 320.1 (H) X 16.5 (D) (typ.)	
7	Weight (g)	2900 (max.)	
8	Surface treatment	Anti-glare, Haze = 25%, Hard coating (3H)	
9	Input color signal	8 bit LVDS	
10	Display colors	16.7 M (6 bit with Hi-FRC)	
11	Optimum viewing direction	6 o'clock	
12	Backlight	4 CCFL	
13	RoHS	RoHS compliance	



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B. Electrical Specifications

1.Pin assignment Connector

JAE FI-XB30SSRL-HF16, Foxconn GS23302-0311R-7F or mechanical interface equivalent connector.

Pin No.	Symbol	Description
Frame	VSS	Ground
1	RXinO0-	-LVDS differential data input, Chan 0-Odd
2	RXinO0+	+LVDS differential data input, Chan 0-Odd
3	RXinO1-	-LVDS differential data input, Chan 1-Odd
4	RXinO1+	+LVDS differential data input, Chan 1-Odd
5	RXinO2-	-LVDS differential data input, Chan 2-Odd
6	RXinO2+	+LVDS differential data input, Chan 2-Odd
7	VSS	Ground
8	RXOC-	-LVDS differential Clock input (Odd)
9	RXOC+	+LVDS differential Clock input (Odd)
10	RXinO3-	-LVDS differential data input, Chan 3-Odd
11	RXinO3+	+LVDS differential data input, Chan 3-Odd
12	RXinE0-	-LVDS differential data input, Chan 0-Even
13	RXinE0+	+LVDS differential data input, Chan 0-Even
14	VSS	Ground
15	RXinE1-	-LVDS differential data input, Chan 1-Even
16	RXinE1+	+LVDS differential data input, Chan 1-Even
17	VSS	Ground
18	RXinE2-	-LVDS differential data input, Chan 2-Even
19	RXinE2+	+LVDS differential data input, Chan 2-Even
20	RXEC-	-LVDS differential Clock input (Even)
21	RXEC+	+LVDS differential Clock input (Even)
22	RXinE3-	-LVDS differential data input, Chan 3-Even
23	RXinE3+	+LVDS differential data input, Chan 3-Even
24	VSS	Ground
25	VSS	Ground
26	NC	No Connection
27	VSS	Ground
28	VCC	+5.0V power supply
29	VCC	+5.0V power supply
30	VCC	+5.0V power supply
Frame	VSS	Ground

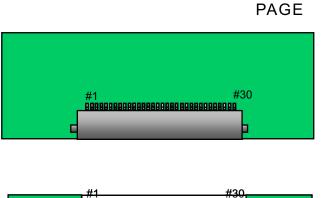
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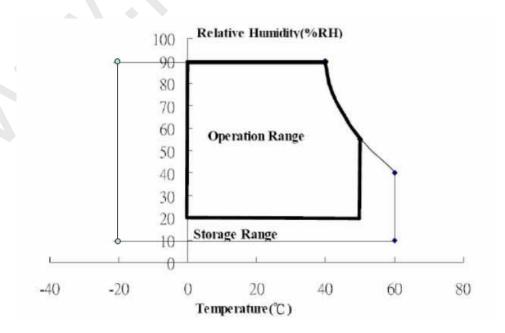


Rear view of LCM

2. Absolute maximum ratings

Parameter	Symbol	Val	Unit	Remark	
		Min. Max.		\	
Power voltage	V _{cc}	-0.3	6	V	At 25°C
Input signal voltage	V _{LH}	-0.3	4.3	V	At 25°C
Operating temperature	Тор	0	50	°C	Note 1
Storage temperature	T _{ST}	- 20	60	°C	Note 2
CCFL Current	ICFL	3	8	[mA]	

Note 1: The relative humidity must not exceed 90% non-condensing at temperatures of 40°C or less. At temperatures greater than 40°C, the wet bulb temperature must not exceed 39°C. Note 2: The unit should not be exposed to corrosive chemicals.





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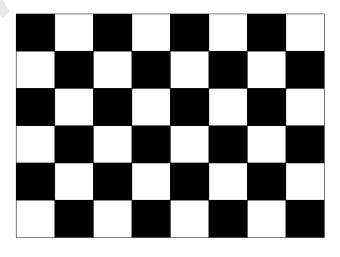
3. Electrical characteristics

a. Typical operating conditions

	Item		Symbol	Min.	Тур.	Max.	Unit	Remark
	Input Voltag	e	V_{cc}	4.5	5	5.5	V	
Permiss	sive Power In	put Ripple	V_{RF}	-	-	0.25	V	
		Black	I _{cc}	-	900	1400		Note 1
Input	Current	White	I _{cc}	-	700	-	mA	Note 2
		Mosaic	I _{cc}	-	800	-		Note 3
	Rush Currer	nt	I _{Rush}	-	-	4	А	Note 4
Logic Input	Common M	lode Voltage	VCM	-	1.2		V	
Voltage	Differential I	nput Voltage	VID	100		600	mV	
LVDS:	Threshold V	oltage (High)	VTH	-	-	100	mV	Note 5
IN+, IN-	Threshold V	oltage (Low)	VTL	-100	.	-	mV	Note 5

- Note 1 : The specified current is under the V_{cc} =5V, 25°C, fv=60Hz (frame frequency) condition whereas black pattern is displayed.
- Note 2: The specified current is under the Vcc =5V, 25°C, fv=60Hz (frame frequency) condition whereas white pattern is displayed.
- Note 3: The specified current is under the Vcc =5V, 25°C, fv=60Hz (frame frequency) condition whereas mosaic pattern(black & white [8*6]) is displayed.

White: 255 Gray Black: 0 Gray

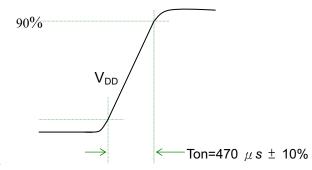




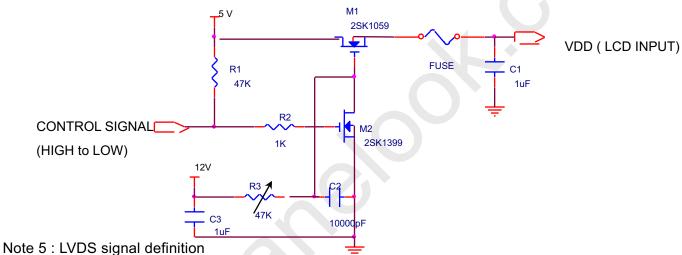
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Note 4: test condition:

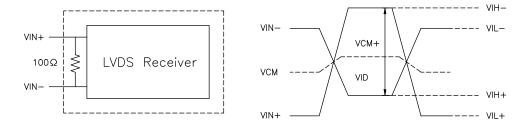
- (1) V_{DD} = 5 V, V_{DD} rising time = 470 μ s ± 10%
- (2) Pattern: Mosaic pattern



(3) Test circuit



Note 5 . EV DO signal delimitor



 $VIN_{\scriptscriptstyle +}$ = Positive differential DATA & CLK Input

VIN- = Negative differential DATA & CLK Input

 $VID = VIN_{+} - VIN_{-}$,

 $\Delta VCM = | VCM_{+} - VCM_{-} |$,

 $\Delta VID = | VID_{+} - VID_{-} |$,

 $VID+ = |VIH_{+}-VIH_{-}|,$

 $VID- = | VIL_{+}-VIL_{-} | ,$

 $VCM = (VIN_+ + VIN_-)/2,$

 $VCM+ = (VIH_+ + VIH_-)/2,$

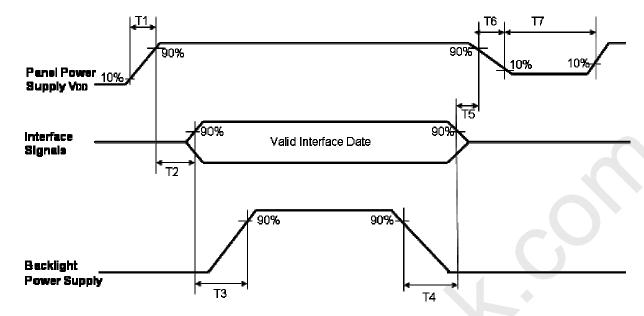
 $VCM- = (VIL_+ + VIL_-)/2,$

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Note 6 : Power on sequence for LCD $V_{\text{\scriptsize DD}}$



Parameter		Value								
	Min.	Тур.	Max.	ms						
T1	0.1		10	ms						
T2	0	-	50	ms						
T3	200	250		ms						
T4	100	250		ms						
T5	0	20	50	ms						
T6	0.1			ms						
T7	1000			ms						



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b. Display color vs. input data signals

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color; the higher the binary input, the brighter the color. The table below provides a reference for color versus data input.

												Inp	ut (col	or d	lata	l								
Color					R	ed				Green							Blue								
		MS	B	1				L	SB	N	ISB				1	L	SB	MS	SB					L	SB.
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	В7	В6	B5	В4	ВЗ	B2	B1	В0
Basic colors	Black Red(255) Green(255) Blue(255) Cyan Magenta Yellow White	0 1 0 0 0 1 1	0 1 0 0 0 1 1	0 1 0 0 0 1 1	0 1 0 0 1 1 1	0 1 0 0 0 1 1	0 1 0 0 1 1	0 1 0 0 0 1 1	0 1 0 0 1 1 1	0 0 1 0 1 0 1 1	0 0 1 0 1 0 1 1	0 0 1 0 1 1 1	0 0 1 0 1 0 1 1	0 0 1 0 1 0 1	0 0 1 0 1 0 1	0 0 1 0 1 0 1	0 0 1 0 1 0 1	0 0 1 1 1 0	0 0 0 1 1 1 0	0 0 1 1 1 0	0 0 0 1 1 1 0 1	0 0 1 1 1 0 1	0 0 1 1 1 0	0 0 0 1 1 1 0	0 0 0 1 1 1 0
Red	Red(000) dark Red(001) Red(002) : Red(253) Red(254) Red(255) bright	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 1 : 0 1	0 1 0 : 1 0 1	0 0 0 : 0 0	0 0 0 0 0 0	0 0 0 : 0 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0
Green	Green(000)dark Green(001) Green(002) : Green(253) Green(254) Green(255)bright	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 1 : 0 1	0 1 0 : 1 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0
Blue	Blue(000) dark Blue(001) Blue(002) : Blue(253) Blue(254) Blue(255) bright	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 0 0	0 0 0 : 1 1 1	0 0 0 : 1 1	0 0 0 : 1 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 0 : 1 1	0 0 1 : 0 1	0 1 0 : 1 0

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c. Input signal timing

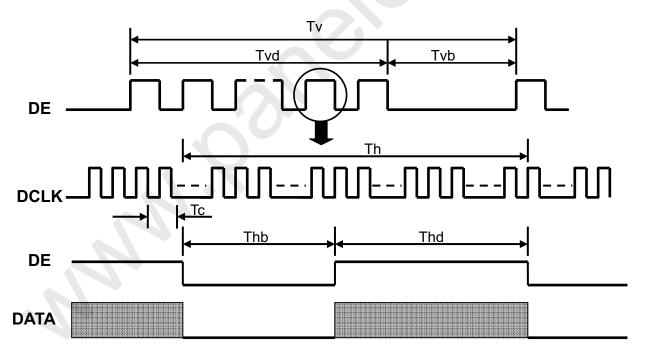
Support Input Timing Table

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Description	Min.	Тур.	Max.	Unit
Clock	Dclk	period	12.2	16.8	21.23	nS
	DCIK	frequency	47.1	59.6	82	MHz
	T_{V_TOTAL}	V total line number	1059	1080	1100	T _H
Vertical	T_{V_DATA}	Data duration	1050	1050	1050	T _H
vertical	T _{VB}	V-blank	9	30	50	T _H
	f _V	frequency	50	60	76	Hz
Horizontal	T _{H_TOTAL}	H total pixel number	890	920	1004	DClk
	T _{H_DATA}	Data duration	840	840	840	DClk
	Тнв	H-blank	73	80	164	DClk

Note: Because this module is operated by DE only mode, Hsync and Vsync input signals should be set to low logic level or ground. Otherwise, this module would operate abnormally.

INPUT SIGNAL TIMING DIAGRAM



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d. Display Position

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D(1, 1)	D(2, 1)	 D(840, 1)	 D(1679, 1)	D(1680, 1)
D(1, 2)	D(2, 2)	 D(840, 2)	 D(1679, 2)	D(1680, 2)
:		 :	 :	:
D(1, 525)	D(2, 525)	 D(840, 525)	 D(1679, 525)	D(1680, 525)
:		 :	 :	:
D(1, 1049)	D(2, 1049)	 D(840, 1049)	 D(1679, 1049)	D(1680, 1049)
D(1, 1050)	D(2,1050)	 D(840, 1050)	 D(1679,1050)	D(1680, 1050)

e. Backlight driving conditions

Parameter	Symbol	Min.	Тур.	Max.	Unit	Remark	Remark
Lamp voltage	VL	680(8mA)	794(7mA)	955(3mA)	Vrms		Note 1, 2
Lamp operation current	IL	3	7	8	mArms		Note 3
I amount attending a continue	VLstart			1250	Vrms	T = 25°C	Note 4,5,6,7
Lamp starting voltage				1570		T = 0 °C	Note 4,5,6,7
Frequency	F	40	55	60	KHZ		Note 7
Lamp life time		40000	50000		Hr		Note 8

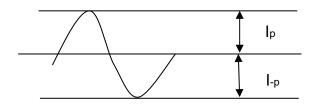
The waveform of the voltage output of inverter must be area-symmetric and the design of the Note: inverter must have specifications for the modularized lamp. The performance of the Backlight, such as lifetime or brightness, is greatly influenced by the characteristics of the DC-AC inverter for the lamp. All the parameters of an inverter should be carefully designed to avoid producing too much current leakage from high voltage output of the inverter. When designing or ordering the inverter please make sure that a poor lighting caused by the mismatch of the Backlight and the inverter (miss-lighting, flicker, etc.) never occurs. If the above situation is confirmed, the module should be operated in the same manners when it is installed in your instrument.

Note 1: Specified values are for a single lamp.

Note 2: Operating voltage is measured at $25 \pm 2^{\circ}$ C. The variance of the voltage is $\pm 10\%$.

Note 3:

The degree of unbalance: less than 10% The ratio of wave height: less than $\sqrt{2} \pm 10\%$



Ip: high side peak

I-p: low side peak

The degree of unbalance = $|I_p-I_{-p}| / Irms*100(\%)$

The ratio of wave height = $I_p(\text{or } I_{-p})/\text{Irms}$

Lamp should be completely turned on.



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Note 4: Test equipment: AS-114B

Note 5: The voltage shown above should be applied to the lamp for more than 1 second after startup. Otherwise, the lamp may not be turned on normally.

Note 6: Inverter should provide more than max. value, and then lamp could be completely turned on.

Note 7: Lamp frequency may produce interference with horizontal synchronous frequency and this may cause line flow on the display. Therefore lamp frequency shall be detached from the horizontal synchronous frequency and its harmonics as far as possible in order to avoid interference. Lamp Hi-POT test spec: The current leakage should not be more than (<=) 0.9mA under the conditions of "the frequency of the inverter output voltage keeping 60Hz, test voltage keeping 3.0KV and test time keeping 2sec".

Note 8: Lamp life definition: The brightness of lamp becomes 50% of the initial brightness or not normal lighting.

Backlight connector: 35001HS-02L

Pin no.	Symbol	Function	Remark
1	VIH	Lamp high voltage input	Cable color: Pink
2	VIL	Lamp low voltage input	Cable color: White
3	VIH	Lamp high voltage input	Cable color: Blue
4	VIL	Lamp low voltage input	Cable color: Black



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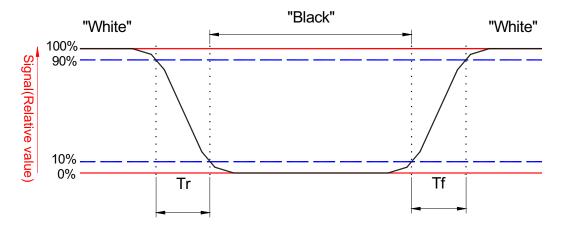
C. Optical Specifications

	Symbol	Condition	Specification				
Item			Min.	Тур.	Max.	Unit	Remark
	Tr			1.5	3	ms	
Response time	Tf	$\theta = 0^{\circ}$		3.5	7		Note 4
	Tr+Tf			5	10		
Contrast ratio	CR	θ= 0°	500	700			Note 3,5
	Ton	CR≧10	70	80			
	Тор	CR≧5	75	85			Note 3,5,7
	Bottom	CR≧10	70	80		deg.	
Viewing angle		CR≧5	75	85			
viewing angle	Left	CR≧10	75	85	•		
		CR≧5	80	89			
	Right	CR≧10	75	85			
		CR≧5	80	89			
Brightness (Center)	YL		200	250		nit	Note 3,6
	Wx	$\theta = 0^{\circ}$	-0.03	0.313			Note 3
	Wy			0.329			
	Rx			0.640			
	Ry			0.349	+0.03		
Color chromaticity(CIE)	Gx			0.284			
	Gy			0.617			
	Bx			0.142			
	Ву			0.067			
White uniformity (9 points)	δw		0.75	0.80			Note 3,8
Cross talk	Ct				2%		Note 9

- Note 1: Ambient temperature = 25°C.
- Note 2: To be measured in dark room after backlight warm up 30 minutes.
- Note 3: To be measured with a viewing cone of 2°by Topcon luminance meter BM-5A.
- Note 4: Definition of response time: The output signals of BM-7 are measured when the input signals are changed from "Black" to "White" (falling time) and from "White" to "Black" (rising time), respectively. The response time interval is between the 10% and 90% of amplitudes. Refer to figure as below:



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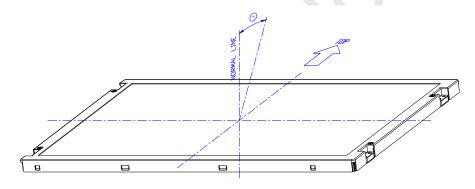
Note 5: Definition of contrast ratio:

Contrast ratio is calculated by the following formula.

Brightness on the "white" state Contrast ratio (CR)= Brightness on the "black" state

Note 6: Driving conditions for CCFL: I_L= 7mA, 50 KHz Frequency.

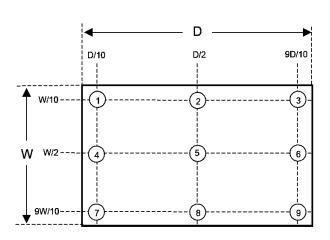
Note 7: Definition of viewing angle.



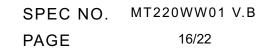
Note 8: Definition white uniformity:

Luminance are measured at the following nine points (P1~P9).

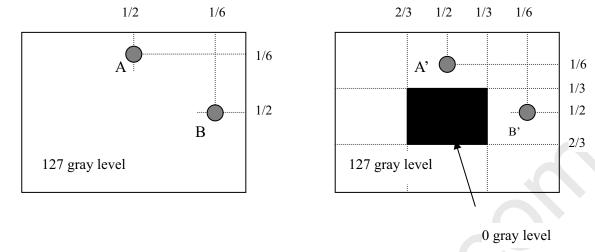
Minimum Brightness of nine points (P1~P9). $\delta w =$ Maximum Brightness of nine points (P1~P9).





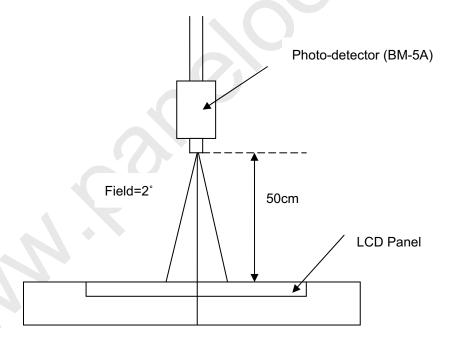


Note 9:



I L_A - $L_{A'}$ I / L_A x 100%= 2% max., L_A and $L_{A'}$ are brightness at location A and A' $IL_B-L_{B'}I/L_B \times 100\% = 2\%$ max., L_B and $L_{B'}$ are brightness at location B and B'

Note 10: Optical characteristic measurement setup.





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D. Reliability test items

Test Item	tem Test Condition		Remark	
High temperature storage	60°C, 240Hrs	Note 1	Note 2	
Low temperature storage	-20°C, 240Hrs	Note 1	Note 2	
High temperature & high	40°C, 90%RH, 240Hrs	Note 1	Note 2	
humidity operation	(No condensation)			
High temperature operation	50°C, 240Hrs	Note 1	Note 2	
Low temperature operation	0°C, 240Hrs	Note 1	Note 2	
Thermal Shock	-20°C~60°C	Note 1	Note 2	
(non-operation)	1Hr, 5mins, 1Hr, 100cycles			
Electrostatic discharge (ESD)	Contact:+/-8kV, 150pF(330ohms),	Note 1	Note 2	
(non-operation)	10 times/1 point, 1 time/1 sec			
	Air discharge:+/-15kV, 150pF(330ohms),			
	10 times/1 point, 1 time/1 sec			
Vibration	Vibration level : 1.5G	Note 1	Note 2	
(non-operation)	Bandwidth : 10-300Hz			
	Waveform : sine wave,			
	sweep rate : 10min			
	30 min for each direction X, Y, Z			
	(1.5 Hrs in total)			
Mechanical Shock	Shock level : 50G, 11ms	Note 1	Note 2	
(non-operation)	Waveform : Half sine wave			
	Direction: ±X, ±Y, ±Z			
	One time each direction			
MTBF Demonstration	40,000 hours with confidence level 90%	Note 1	Note 3	

Note1: Pass: Normal display image with no obvious non-uniformity and no line defect. Partial transformation of the module parts should be ignored.

Fail: No display image, obvious non-uniformity, or line defects.

Note2: Evaluation should be tested after storage at room temperature for one hour.

Note 3: The MTBF (exclude the CCFL) calculation is based on the assumption that the failure rate distribution meets the Exponential Model.



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E. Safety

1. Sharp Edge Requirements

There will be no sharp edges or corners on the display assembly that could cause injury.

2. Materials

a. Toxicity

There will be no carcinogenic materials used anywhere in the display module. If toxic materials are used, they will be reviewed and approved by the responsible InnoLux Toxicologist.

b. Flammability

All components including electrical components that do not meet the flammability grade UL94-V1 in the module will complete the flammability rating exception approval process. The printed circuit board will be made from material rated 94-V1 or better. The actual UL flammability rating will be printed on the printed circuit board.

c. Capacitors

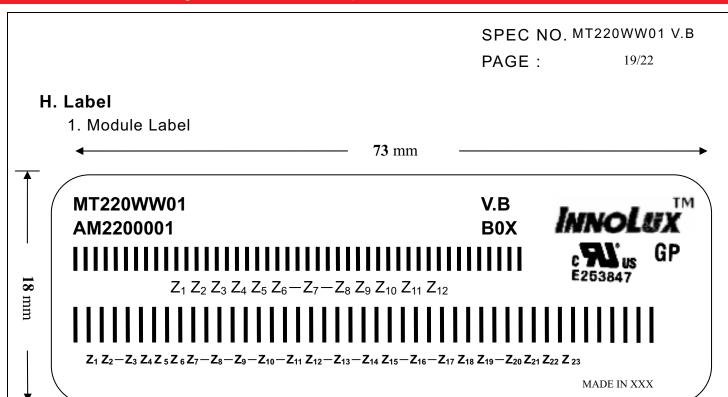
If any polarized capacitors are used in the display assembly, provisions will be made to keep them from being inserted backwards.

F. Display quality

The display quality of the color TFT-LCD module should be in compliance with the Innolux's Incoming inspection standard.

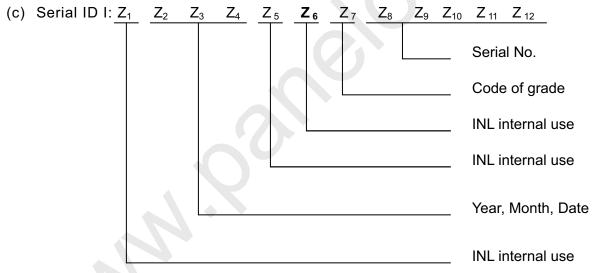
G. Handling precaution

The Handling of the TFT-LCD should be in compliance with the Innolux's handling principle standard.



(a) Model Number: MT220WW01

(b) Version: V.B



Serial ID includes the information as below:

1. Manufactured Date: Year: 0~9, for 2000~2009

Month: 1~9 & A~C for Jan.~Dec.

3. Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th

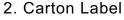
4. Code of grade: 1, 2, 3, 5, E

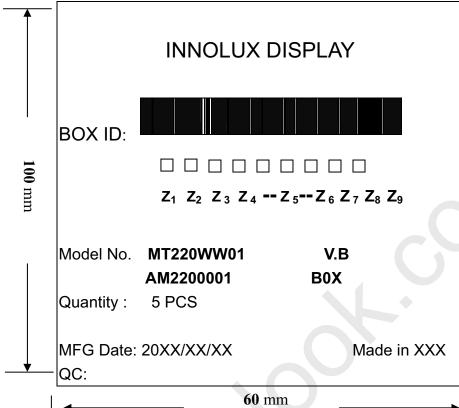
Serial No.: Module manufacture sequence number.

(d) Serial ID II (INL internal use)

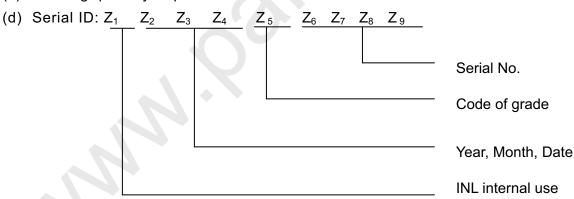
SPEC NO. MT220WW01 V.B

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- (a) Model Number: MT220WW01
- (b) Version: V.0
- (c) Packing quantity: 5 pcs



Serial ID includes the information as below:

(a) Manufactured Date: Year: 0~9, for 2000~2009

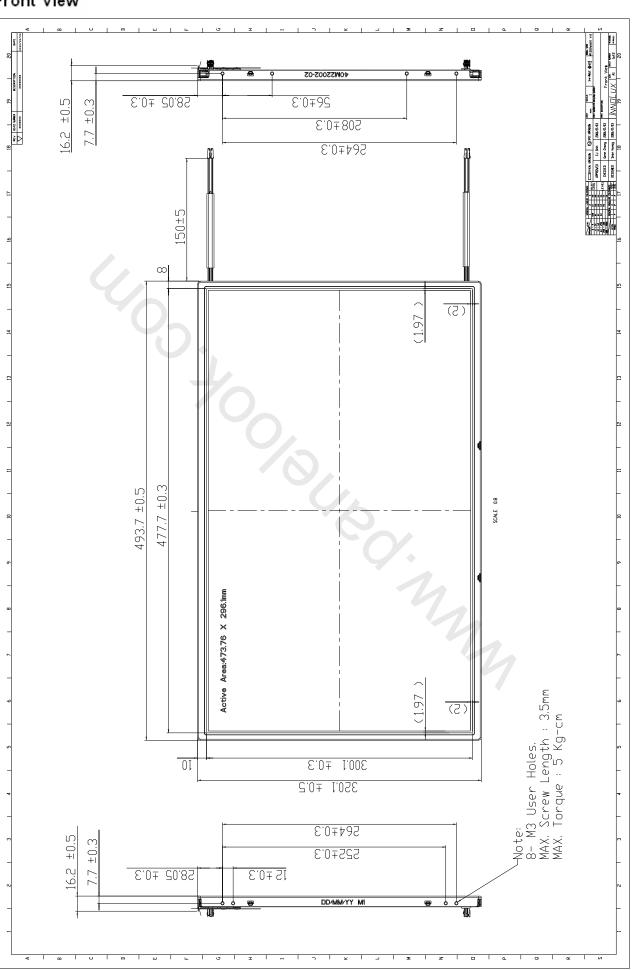
Month: 1~9 & A~C for Jan.~Dec.

Date: 1~9 & A~Z (exclude I, O, Q, U) for 1th~31th

- (b) Code of grade: 1, 2, 3, 5, E
- (c) Serial No.: Module packing sequence number.

I. ME Drawing

1. Front View



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屏庫:全球液晶屏交易中心

